TECHNOLOGY DEPT.

The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

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No. 1217

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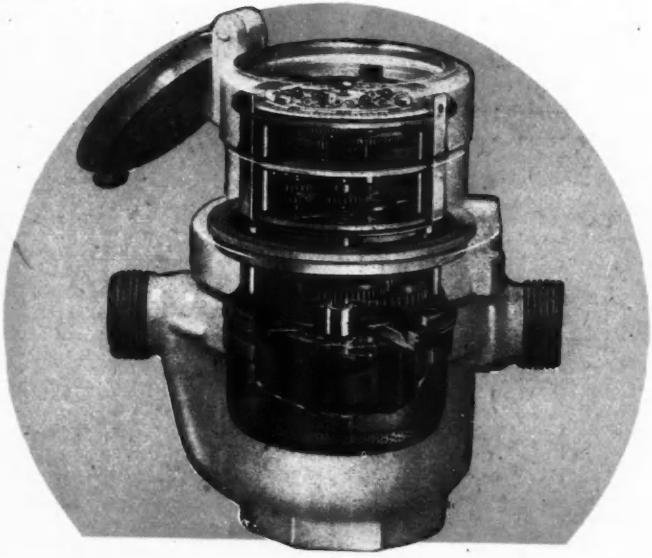

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Aspects of an Industry

BEASTS OF THE FIELD

THE British are a race of animal lovers. A sick beast is a matter of active concern. War has starkly reminded everyone in Britain of the close connection between the healthy man and the healthy animal. To-day the well-being of every man, woman and child rests in part on the health of our livestock. Healthy cattle mean more and better meat, milk and butter ; healthy sheep and lambs, more wool and food ; healthy pigs, more bacon ; fit poultry, more eggs ; and horses sound in wind and limb mean more work on the farm. The maintenance of good health and the prevention of disease amongst farm animals are thus vital. Under the spur of necessity British veterinary medicine is playing an essential role in the national economy. Although the subject of veterinary science was studied in some continental cavalry schools in the fifteenth century, it was not until 1790 that a veterinary college was established in London. The great advances made in preventive medicine in the nineteenth century were a stimulus to a similar attack on the scourges to which animals are subject. The results are seen to-day in the way many diseases have been eliminated or brought under effective control. In the British Isles rinderpest, the cattle plague that kills millions of beasts in Europe and Africa, does not now exist. Glanders of horses is rare. The deadly rabies, so often transmitted to Man by the bite of a mad dog, belongs to the past. Anthrax is no longer a farmer's nightmare. Destructive diseases of sheep and lambs due to gas gangrene bacilli can be prevented and cured. Foot and mouth disease is better under control than anywhere else in Europe. But these achievements, great in themselves though they are, are no more than a beginning. The fight must go on against tuberculosis, contagious abortion, mastitis, sterility, and ill-health due to parasitic worms—diseases which have been estimated to cost the farmer twenty millions sterling a year ! In the era of preventive animal medicine now opening, synthetic organic chemicals will play a decisive part. The worker in the biological research laboratory and the chemist in the factory are uniting to help the veterinary profession to control the diseases of animals and thereby to sustain the health of the Nation.

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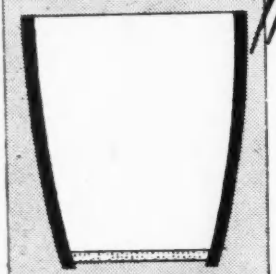

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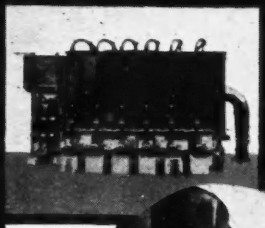

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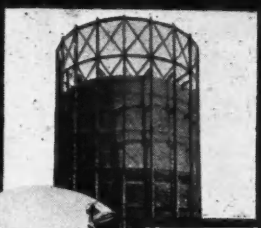

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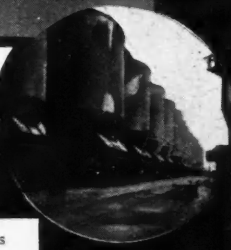

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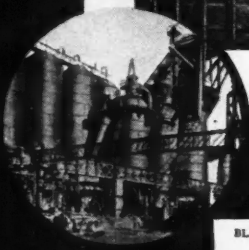

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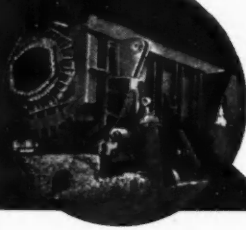

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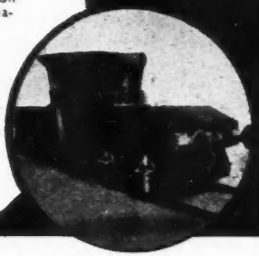

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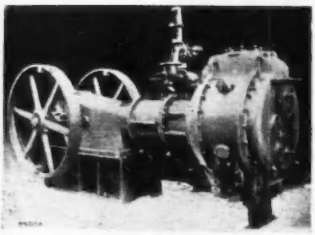
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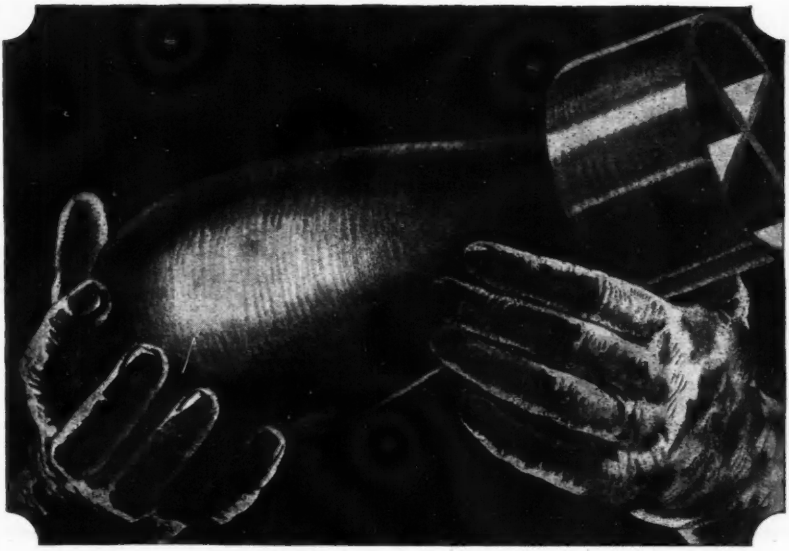

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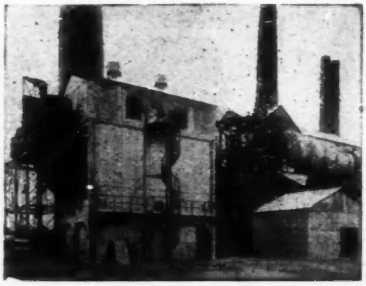

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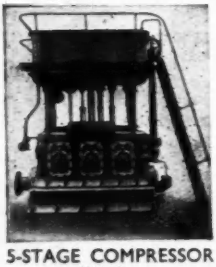

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Radium

THE discovery of radium has occurred within the lifetime of many of our readers and during those years there has sprung up as a result a new physics with new conceptions of the constitution of matter based on that discovery. Radium has enabled the age of geological strata to be determined and has enlarged geological horizons. The science of medicine has been revolutionised by radiotherapy, which in its turn has given rise to a whole series of ray treatments. Those who have read Eve Curie's biography of Marie Curie will remember that all this occurred because Marie Curie, a Polish girl with an overmastering desire for a scientific career, wished to take her doctor's degree. At the end of 1897 Marie had two university degrees and was seeking a subject for research for her doctorate. After considering many subjects she decided to work upon the observation of Becquerel that uranium salts spontaneously emitted rays of an unknown nature. The work, involving electrical research, was done in "a kind of store room, sweating with damp, where unused machines and lumber were put away. Its technical equipment was rudimentary and its comfort nil."

In these adverse circumstances revolutionary work was carried out which resulted in the discovery of radium. The scientific world was only partly convinced, however, and it became necessary to prepare a specimen of the new element. This involved operating on a ton of pitchblende, and the intricate chemical researches were done "in a wooden shack, an abandoned shed, with a skylight roof in such bad condition that it admitted the rain. . . . It was furnished with some worn kitchen tables, a blackboard which had landed there for no known reason, and an old cast-iron stove with a rusty pipe." There the Curies worked out a method for the recovery of the trace of radium present in the ton of pitchblende, about 0.1 gram. It is a remarkable fact, mentioned by Mr. E. F. MacTaggart in his recent paper to the Chemical Engineering Group and the Institution of Chemical Engineers on "The Production of Radium," that throughout the world, although variations in the composition of the ores used necessitates modifications of the general system of extraction, this still follows the scheme originally worked out by Marie Curie. Many processes have been claimed, but they all appear to have the general disadvantage of requiring the use of

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very special plant and materials of construction if they are to be used commercially.

Mr. MacTaggart's paper is a fascinating and highly instructive account of the many radium factories that have been operated during the last 20 years in various parts of the world. It is a mine of information on the modifications of the general system of extraction that are necessary by reason of the variations in ore composition, as indicated above. There is no radium factory in this country, so that for us the information is more academic than urgently practical. It raises, however, a nice problem in what should be the procedure in the development of the extraction industry. Radium is an element that derives its pecuniary value from its rarity and the uses to which it is put. It must always be expensive to obtain by reason of the immense complexity of the processes used in its isolation. There are some commercial uses for radium, but they are comparatively small and unimportant. Its major uses are (a) medical and (b) as a research weapon; and of these the former obviously transcends all others.

Because it was so important for the continued progress of human welfare that radium should be made available, the Curies, although living in relative poverty and finding it exceedingly difficult to finance their researches, decided not to patent their methods of discovery and to give their knowledge freely to industrialists. Eve Curie records how requests were received from commercial undertakings who wished to exploit radium in foreign countries and how the discoverers made their choice between publication of the results of their research without reserve, including the processes of purification, and patenting their discovery. To patent the discovery would bring them comfort, the suppression of drudgery, and what both the Curies urgently desired, a fine laboratory. They decided to take no material profit from their discovery and to give to interested persons all the information they requested. To the end of her life Marie Curie maintained that she had been right, even though she was handicapped through lack of funds in her research work for many years to come. "If we had guaranteed our rights," she wrote in 1921, "we should have acquired the financial means necessary to the creation of a satisfactory radium institute, without encountering the obstacles which were a handicap to both of us and which are still a handicap to me," and she added, "without the slightest doubt these dreamers do not deserve wealth, because they do not desire it. Even so, a well-organised society should assure to such workers the efficient means of accomplishing their task, in a life freed from material care and freely consecrated to research."

So far as the evidence goes we are not aware that the manufacturers of radium have ever financed research work into the uses of radium. In this we may be unwittingly doing them an injustice, but it is evident from Mr. MacTaggart's paper that radium production is to-day on a strictly commercial basis since American producers ceased production in 1927 when the effects of the Belgian output were felt on the market, but they began again in 1934 because of the increase in importance of vanadium in metallurgy which caused a greater tonnage of uranium to be produced. Mr. MacTaggart added that "the rapidly rising trend of world production received a rude setback when in June, 1940, it was announced that the Canadian producer intended shutting down immediately owing, it may be presumed, to the closing of the European markets and the accumulation of stocks of radium in the United States whither it had been sent for safe custody."

Since 85 per cent. of the radium produced is used for medical purposes and the demand for radium still appears to be insatiable, it is open to question whether the production of radium should be governed by commercial considerations in the light of the self-sacrifice made by its discoverers. Should not radium production be a Government venture in which the greatest quantity of radium is produced, and stored under suitable circumstances if it cannot be employed immediately, irrespective of market considerations? This is one of the questions that will require investigation after the war, when, it is to be presumed, some plan for the proper usage of the world's natural resources for the benefit of humanity in general will be put into effect. The provision of radium should emphatically not depend upon fortuitous charity; its utilisation may fairly be classed as a "public utility service."

NOTES AND COMMENTS

Industry on the Move

"MOBILISATION of industry" becomes a more literal expression when related to the recent pronouncement from the Minister of Production on impending changes in some sections of industry. The mobilisation of labour is almost complete and any distribution of the means of production must now largely find effect in the movement of firms or of plant. There will also be a more rational allotment of orders to factories and some managerial reconstruction. The changes will affect the engineering industry primarily. It is anticipated that some discomfort will be suffered by both employers and workers in the change, but a moment's thought will convince both sides of the necessity for this further closing of the industrial ranks. Little change is expected in the chemical industry. Thanks very largely to the efforts of the Association of British Chemical Manufacturers and the Society of Chemical Industry, the industry has for a long time been rationalised for the greatest possible output towards the war effort.

A First-Class Show

COMPELLING arguments for economy in fuel are graphically represented at the "Battle for Fuel" Exhibition which was opened by Major Lloyd George, Minister for Fuel and Power, at Dorland Hall, Regent Street, London, S.W.1, on Wednesday. No lack of ideas is shown in the display of exhibits. Entry is made through a life-size replica of part of a coal mine (with live pit-pony), and the visitor then finds himself in the domestic part of the exhibition. Here fluorescent lighting is utilised to stress vital points of fuel economy; at the end of the first hall, for example, is seen a man in front of a large fire; this scene vanishes and guns appear in its stead, with the slogan "Comfort or Guns?" Throughout the rooms models and illuminated signs show the actual munitions which can be made if the prescribed savings in fuel are carried out. In the industrial section upstairs graphs, charts, and working models show the fuel economies that can be made in industry. One specially useful demonstration shows how a glaring lamp causes waste, and how dirty fittings may account for a 50 per cent. wastage of current. Methods of dealing with open doors and roof leakages—fruitful heat-wasters—are illustrated, and actual models of machinery, boilers, and furnaces are keyed to show where waste is likely to occur. A special section describes the work of the Ministry of Fuel's combustion engineers. The whole lay-out reflects great credit on the industry and imagination of the Ministry's staff.

Demand for a Scientific Board

A "SCIENCE for Victory" conference held at Cardiff recently demanded the formation of a central scientific and technical board to be in direct contact with the War Cabinet. The conference was held under the auspices of the South Wales area of the Association of Scientific Workers. In stressing the need for a technical planning board, Mr. E. D. Swann said that this should be a full-time body of qualified scientists and engineers with executive powers to ensure that its decisions were carried out. Its function would be to put scientific work on a national basis in relation to war strategy. Another matter dealt with by the conference was the question of wages in the profession, which were criticised as being too low. Professor R. C. McLean said that the earnings of research workers could rarely be compared favourably with those of doctors, engineers, or teachers. Another speaker claimed that the average wage paid by Government departments to laboratory assistants aged 21 was 55s. a week, while the wages of women assistants were yet lower.

African Dye Research

IN this issue of THE CHEMICAL AGE will be found a pictorial feature dealing with developments in the chemical and allied industries in East Africa. A careful study of indigenous plant dyes is being conducted in the colony as a result of difficulties in replacing imported aniline dyes, and a recent report sets out the progress that has been made in this direction. It describes in detail the three most promising dyes for wool, all the dyes mentioned having been tested for their fastness to washing and to light. Among species of *Euclea* which possess

dyeing properties are *E. keniensis*, *E. bilocularis* and *E. fructuosa*. *E. fruticosa* and *E. kellau* are known for the black dye obtained from the root. Plants of this genus are common around Nairobi—small, bushy trees growing preferably near the edge of river-beds. In the various tests carried out with the *Eucleas*, the root-bark gave, according to treatment, a dark brown colour with an olive tinge, a pleasant chestnut-brown (soap test) and (alkali test) a more reddish hue. The leaves gave a bronze-yellow colour to wool boiled with copper sulphate, and, either soaked in cold water or boiled up for one hour, yielded a liquid which dyed alum-mordanted wool a very rich deep golden-yellow. The report states that the colours obtained with any part of *Euclea keniensis* are extremely fast and all of them are very pleasing and useful shades

Khaki Shades

A COMMON climbing plant (*Rubia cordifolia*), found all over East Africa up to 8000 ft., has also proved itself useful for the production of dyes. The root of this and of allied species is stated to give an excellent red dye, perhaps the most valuable red found in East Africa. The dye obtained from the leaves was found of interest because of its fastness and also for the khaki shades which can be obtained through subsequent treatment with ferrous and copper sulphates. The third plant described is *Fuerstia africana*, a small herb with white flowers. The leaves, when crushed, leave a brownish yellow stain. Shades obtained by various treatments included lemon-yellow, greenish-brown, fawn, and a near-khaki. All shades were found to be reasonably fast and, although not very brilliant in colour, suitable as dyes.

Biochemistry and Paint

THE interlocking of the various branches of chemical science is a matter of cardinal importance to the chemical industry. We have always made this contention, and we have often, in leading articles and elsewhere, cited instances where apparently unrelated bits of chemical knowledge proved to be the keystones of an important industrial edifice. For example, knowledge of the action of trace elements in the soil turned out to be a vital factor in agricultural chemistry. New support for this argument has been forthcoming at the recent meeting of the London Section of the Oil and Colour Chemists' Association, where, in the discussion which followed Mr. Davies's paper (reviewed elsewhere in our columns), Mr. W. Garvey spoke of the future of the paint industry. This industry, like many others with a chemical basis, would depend in the future, he said, on the study of minute percentages of impurities. Not enough, evidently, is known concerning the bacteria which can have a deleterious effect on cellulose lacquers, and Mr. Garvey suggested that every paint chemist should undergo a course of biochemistry. This is, no doubt, a counsel of perfection, and it would be fairer to say that every biochemist should know something about paint. Pooling of chemical knowledge is in the wind to-day, and what is really wanted is a centre where the paint chemist and the biochemist can put their heads together and solve the problem between them.

Soft Cellulose Plastics

ANOTHER useful aspect of cellulose derivatives has been receiving attention in America, largely in consequence of the rubber shortage. This is the property which they possess of being convertible into soft rubber-like plastics when compounded with a suitable plasticiser. Mr. David Wiggam, of the Hercules Powder Company, discussing their qualities in the New York *Rubber Age*, comments on a number of these soft plasticised cellulose derivatives—some from ethyl cellulose, others from cellulose acetate—and gives an exhaustive table of their characteristics compared with those of rubber. Certain of these properties are superior to those of rubber, while others are inferior, as might have been expected. Their bouncing capability is poor, for example, but their abrasion resistance excellent. Most generally interesting, however, is the good chemical resistance which is readily obtainable. Long exposure to ozone and to dilute alkalis did not make the cellulose products brittle, and, by the addition of suitable modifiers, they could be made oil-proof or petrol-proof. Practicable plasticisers for use with ethyl cellulose are cottonseed oil and raw castor oil, likewise dibutyl phthalate; dimethyl and diethyl phthalates and methylphthalyl ethyl glycollate are suggested for use with cellulose acetate.

Recent Developments in Analytical Chemistry—III

(From Our Analytical Correspondent)

SINCE the publication of the previous article in this series, the 1941 volume of the *Annual Reports on the Progress of Applied Chemistry* has been issued. In addition to much useful miscellaneous information, sections are included in the volume which deal specifically with the analysis and testing of fuels, mineral oils, pulp and paper, glass, ceramics, refractories and cements, fats and detergents, paints and varnishes, rubber, leather, soils, plants, sugars, starches, foods, essential oils, and water. In conjunction with the *Annual Reports on the Progress of Chemistry*, this volume forms an addition of first importance to the review literature of chemistry.

Alkaline Earth Metals

Strontium.—The usual method of determining strontium in the presence of calcium depends on the conversion of the two metals to the anhydrous nitrates. Calcium nitrate, which is relatively soluble in alcohol-ether mixtures or in amyl alcohol, is then extracted, a double extraction usually being required for precise work. A standardised procedure has been developed[1] by which the separation is effected with acetone. Results agreeing to within 0.5 per cent. have been obtained on samples varying over a wide range of size and composition.

Calcium.—Calcium in water can be estimated separately from magnesium by a rapid modification of the normal methods for determining hardness of water.[2] It is found that if the *p*H is accurately adjusted to the range 11.7-12.0 (by the use of ammonium chloride and sodium hydroxide) titration against soap solution to the lathering point only gives a figure for the calcium content. At this *p*H magnesium does not react, nor do other ions which may be expected in water interfere. It is obvious that by carrying out a parallel determination of total hardness (*i.e.*, calcium and magnesium) in the normal way, a difference figure may be obtained for the magnesium concentration.

Magnesium.—The estimation of magnesium in small quantities (micro) may be performed gravimetrically, volumetrically or colorimetrically. The usual gravimetric micro method,[3] dependent on precipitation of magnesium as magnesium ammonium phosphate, was found to give untrustworthy results when applied to silicate dusts.[4] The factor responsible for this appears to be the time of standing of the precipitate. After 45 minutes the composition of the precipitate approximates to that required by the formula $NH_4.MgPO_4.6H_2O$, but after an hour the amount of the magnesium in the precipitate is less than this, and reaches a constant value. To allow for this, a factor of 0.09703 is recommended instead of the 0.09908 calculated from the formula. The precipitation of magnesium by 8-hydroxyquinoline, followed either by titration or by colorimetric determination, has been investigated.[5] The magnesium precipitate is obtained by neutralisation of the sample to phenol red, addition of the reagent and then of ammonia, and warming. If titration is preferred, this precipitate is dissolved in perchloric acid and titrated against ceric ammonium nitrate in perchloric acid solution (essentially ammonium hexaperchlorato-cerate). Since, however, frequent standardisation of solution is necessary for this procedure, a colorimetric method is stated to be preferable. The magnesium precipitate is dissolved in 1 per cent. acetic acid. Addition of 3 per cent. ferric chloride solution causes a green colour to develop in five minutes; this colour is stable for 24 hours, and is preferably measured using a filter which transmits at 6500 A.U.

Non-Metals[6]

Arsenic.—Two very similar methods for estimating this element claim superiority over the official Gutzeit method. Jacobs and Nagler[7] suggest that the arsenic should be evolved as arsine, in which form it is scrubbed by lead acetate to remove sulphuretted hydrogen. The gas is then oxidised by sodium hypobromite to arsenate, and treated with a sulphuric acid-ammonium molybdate solution to develop the blue colour. After half an hour the colour is compared against similarly treated stan-

dards. The method of Milton and Duffield[7] is essentially similar to that of Sandell described earlier.[6] The principal difference is that weak iodine solution is used as absorbent for the arsine instead of mercuric chloride-potassium permanganate, and is claimed to be more efficient. Molybdenum methods for arsenic are stated to be preferable for two reasons: the colour is more reproducible, and the method may be applied to amounts as low as 1.5 μg., whereas the Gutzeit is only satisfactory to a lower limit of 25 μg. Arsenic in organic compounds may be determined by a titration method[9] which depends on multiplication for its accuracy—the technique first used by Winkler for iodine determination.[10] After decomposition of the organic material by a sulphuric acid-nitric acid mixture, elementary arsenic is precipitated by sodium hypophosphite-hydrochloric acid. The arsenic is dissolved in a potassium bromate-potassium bromide solution, and potassium iodide is then added to react with the excess bromine. Since the reaction: Arsenic (metal) → Arsenate, requires five atoms of bromine, there is at this stage a multiplication by five. The liberated iodine is in turn estimated by a sodium arsenite titration in buffered solution.

Phosphorus.—Investigation of the A. O. A. C. molybdenum blue method for this element suggests[11] that the *p*H at which the determination is carried out is a vital factor. If the solution is buffered at *p*H 2 (sodium succinate is suggested as suitable for this purpose), reproducible results may be obtained when measuring the colour at any time up to four hours after its formation. The yellow phosphovanadomolybdate complex used by Koenig and Johnston[6] is also employed by Center and Willard[12] for determination of phosphorus in iron ores. These authors point out that if the iron content is low, the phosphorus value is also low, and must be corrected by a specially prepared calibration curve.

Phosphate Analysis

An extensive system for the analysis of phosphates is described by Jones.[13] By this, ortho-, pyro-, meta- and polyphosphates may be determined in the presence of one another. The preliminary stage is a determination of total phosphorus. The phosphate solution, acidified with nitric acid, is boiled gently for 15 minutes, and the total phosphates, which are all, by this treatment, converted to orthophosphate, may be precipitated either by ammonium molybdate or as ammonium magnesium phosphate. In the latter case the precipitate is subsequently ignited and weighed as magnesium pyrophosphate. A fresh sample is used for determination of hexametaphosphate or trimetaphosphate. The solution, made slightly acid with normal hydrochloric acid, is treated with barium chloride solution. The barium hexametaphosphate is filtered off, washed, dissolved in 50 per cent. nitric acid, and converted to orthophosphate, being then determined as in the case of total phosphorus. Trimetaphosphate is precipitated from the filtrate by making it definitely alkaline with caustic soda. The precipitate of barium salt is treated similarly to the previous one. In yet another sample the hexametaphosphate is first precipitated in a solution just acid to methyl red, and eliminated. If solid ammonium nitrate is then added, only orthophosphate is precipitated by ammonium molybdate. A further sample once more has the hexametaphosphate precipitated with a 10 per cent. excess of barium chloride solution. The diluted filtrate is treated with manganous chloride solution, adjusted to *p*H 4.1, and acetone is added. On standing, pyrophosphate is precipitated as the manganous salt, which is subsequently converted to orthophosphate and estimated as before. The difference between all these values for the various phosphates and that for total phosphorus will give the amount of phosphorus present as polyphosphates.

Strychnine-Molybdate Test

Several qualitative tests for orthophosphate have been surveyed[14] and a mode of testing with strychnine-molybdate has been evolved as satisfactory in the presence of a large number of ions and other substances. The test is claimed to be specific. The reagent solution consists of a solution of molybdic acid and strychnine sulphate in nitric acid. On a spot plate a drop of this with a drop of orthophosphate solution will give a yellow precipitate. This may be verified as a true positive by treating the precipitate with a reducing agent, benzidine in the presence of sodium acetate being recommended. If the precipitate is really a

phosphomolybdic complex molybdenum blue will be formed.

Silicon.—The method of Hadley[4] has been used in the determination of silicon in certain aluminium alloys.[18] For some unexplained reason it was found that certain samples give values which are lower than those obtained by both gravimetric and spectrographic methods. Caution in the use of this method is therefore advisable.

Halides

Bromine.—In order to determine the amount of bromine in cerebrospinal fluid a method has been worked out by Hardwick.[16] The method therefore is applicable to very small (micro) amounts of bromide in the presence of chloride and of organic material. The sample is heated in a sealed tube with sodium ethoxide to convert the bromine completely to sodium bromide, at the same time avoiding loss of bromine. Alkaline ashing then destroys remaining organic matter. Two methods for the final part of the determination are described. The first consists in an iodine liberation followed by titration with standard thiosulphate. The second is colorimetric. On treatment with chloramine-T the bromine is liberated and reacts with fluorescein to form eosin, which is measured colorimetrically. Fluorescein has been used in another recently published method.[17] Bromate in the presence of bromide reacts readily with fluorescein, and one drop of 0.1 per cent. solution of this compound per 10 ml. of solution has been recommended as indicator in bromometric titrations of, say, arsenious acid. In acid solution the colour changes from greenish-yellow through brownish-yellow to reddish-brown at the end point. As the reaction is not immediate, warming to 40°-50° C., and 15 second intervals after each addition of solution, are advised as the end point is approached.

Some years ago an estimation of bromide dependent on a violet colour given by free bromine with the leucobase of fuchsin was proposed.[15] A variation of this method has been put forward by Turner.[19] Potassium persulphate in sulphuric acid liberates bromine, but does not liberate chlorine. If to a solution containing bromine freed in this way an excess of Schiff's reagent is added, the coloured compound may be extracted by benzyl alcohol. The red-purple alcohol solution is then subjected either to spectrophotometric or to visual measurement. A yellow filter transmitting in the region 5850 A.U. is recommended.

Iodine.—When an alkaline solution of iodide is treated with ozone it goes quantitatively to periodate. This reaction has been utilised for estimation of either small or large amounts of iodide in the presence of chloride.[20] When excess of solid potassium iodide is added to the periodate solution it may react in one of two ways, according to the conditions. In a neutral buffered solution two iodide ions will react with one periodate ion, giving a molecule of free iodine:

$$IO'_4 + 2I' \rightarrow IO'_3 + I_2$$

This reaction is suitable where large amounts of original iodide are being determined. If the solution is acid (with hydrochloric acid) we find that each derived periodate ion reacts with seven iodide ions to give four iodine molecules:

$$IO'_4 + 7I' \rightarrow 4I_2$$

This multiplication by four is therefore most suitable when only small amounts of iodide are being measured.

Organic Analysis

Alcohols.—Three methods for the identification of alcohols have been published recently. All these depend on the formation of characteristic derivatives. In the first of them[21] the potassium xanthate of the alcohol is prepared by warming with potassium hydroxide and carbon bisulphide. The resulting xanthate is recrystallised from methyl alcohol-*iso*propyl alcohol. The identity of the original alcohol may then be determined both by the melting point and by the iodine value of the derivative. The 3:5-dinitrobenzoates are recommended by Lipscomb and Baker[22] as suitable for identification of the alcohol produced in the hydrolysis of an ester. For this purpose it is unnecessary to separate the alcohol first, as the dinitrobenzoate is formed readily by shaking the alcohol with a benzene-ligroin solution of 3:5-dinitrobenzoyl chloride in the presence of sodium hydroxide and sodium acetate while cooling to 0° C.. Subsequent extraction with ether gives the derivative, which needs no further purification. An excellent survey of the optical properties of the esters of alcohols with carbanilic acid[23] enables these derivatives to be utilised. The esters resulting from reaction with phenyl *iso*cyanate are recrys-

tallised from petroleum ether, and a small sample further recrystallised from ethyl alcohol. Using the polarising microscope, the extinction angle, refractive indices, and other optical properties are determined, and enable not only single alcohols from a tested range of 23 to be identified, but are also utilisable in mixtures, since in binary mixtures the esters of the different alcohols crystallise in the same forms as they do when pure.

Microscopic Methods

The microscopic appearance of the osazones of a large range of sugars under the low-power instrument have been photographed.[24] The commonly occurring pentoses, methyl pentoses, hexoses, and disaccharides are covered in the survey, and the details given enable these compounds to be used as a guide, in conjunction with other tests, for sugar analysis. It is pointed out, however, that since a number of sugars may yield the same osazone, this test alone does not provide an absolutely hard and fast characterisation.

The derivatives of some of the barbiturates have been prepared[25] and, together with an earlier survey,[26] a sufficiently complete record of optical properties is given to enable barbiturates which cannot be distinguished chemically to be identified conclusively.

Several years ago a quantitative method which utilised the polarising microscope was published.[27] A method was required for the estimation of the 1 :8-disulphonic acid of anthraquinone in the presence of the 1 :5-acid. The method developed involved the precipitation of the barium salts under controlled conditions. The salt of the 1 :8-acid appeared as doubly refracting crystals, whereas that of the 1 :5-acid seemed to be amorphous. It was possible, therefore, by counting the numbers of particles visible in the polarising microscope, to arrive at a figure for the concentration of the 1 :8-acid which was within ± 0.5 per cent. of the correct value. A development of this method, which would seem to have many possibilities,[28] has been reported. Instead of counting the particles —a somewhat tedious process—the amount of light transmitted by the polarising microscope when the nicols are crossed is measured, using a photoelectric cell. This will not only give a direct measure of the number of particles, but will also provide a valid correction for the variable area of particles which is not allowed for in simple counting. The method has been applied to the estimation of starch, which is bright in polarised light. Other interesting extensions are suggested in the paper. Naturally, if selective luminosity can be imparted to a mixture of particles, the method will be applicable. Fluorescence in ultraviolet light seems an obvious line to be followed up, while selective staining and the use of colour filters is also a field whose investigation may bear fruit.

Miscellaneous

An ingenious thermometric method for the determination of benzene (or similar hydrocarbons) in the presence of cyclohexene and its homologues has been devised by Corson and Brady.[29] It depends on the heat generated by nitration of the aromatic hydrocarbon. A fixed amount (say 50 ml.) of the material for test is added to 100 ml. of nitrating acid in a Dewar flask, the most convenient form of calorimeter. The whole is stirred for ten minutes, and the rise in temperature caused by the nitration reaction is read 20 minutes after the mixing. The percentage of benzene is then read off from a curve which relates the rise of temperature with the benzene concentration. It is obvious that this method has considerable advantages over the usual methods such as that employing refractive index, particularly if small amounts of straight-chain paraffins or other impurities are present. For most accurate work a rigid standardisation of such operations as mixing and stirring must, of course, be maintained, but the method appears to be surprisingly flexible for routine determinations.

Another purely physical method, measurement of partition coefficient, is employed[30] in the analysis of cellulose mixed esters (*e.g.*, cellulose acetate propionate). The ester is first hydrolysed with phosphoric acid, and vacuum distilled. The distillate, which is a water solution of the acids in the same ratio as they occur in the ester, is shaken with butyl acetate. Solving the equations obtained from the previously determined partition coefficients of the separate acids, and from the partition coefficient of the mixture, gives a set of constants which is valid for any given sample of

butyl acetate. These constants enable the molar proportions of the acids in the distillate, and hence in the original ester, to be determined.

Two committee reports recently published will be of interest to analysts. A sub-committee of the Iron and Steel Institute has issued its first report on standard methods of steel analysis.[31] This report deals with the determination of sulphur, phosphorus and lead in carbon steels. Sulphur, oxidised to sulphate by aqua regia, is determined as barium sulphate. When very small amounts of sulphur are present, it is recommended that a known amount of potassium sulphate (equivalent to approximately 10 mgm. of barium sulphate) should be added prior to the precipitation. Phosphorus is converted to the phosphate, which is transformed through the phosphomolybdate to lead molybdate, and weighed in this form. Lead is first precipitated as sulphate in the presence of alcohol, and the lead sulphate is subsequently converted to lead molybdate.

The Committee of Soap and Soap Products of the American Chemical Society has published revised methods for soap sampling and analysis.[32] Some of the topics dealt with are the process of sampling and the subsequent treatment of samples; analysis for moisture, total matter insoluble in alcohol, free acid or alkali, matter insoluble in water, alkaline salts; total anhydrous soap, chloride, unsaponified matter, unsaponifiable matter; rosin, solidification point and acid number of the fatty acids, iodine number; borax, silica, carbonates, phosphates, sulphur; glycerol, sugar, starch, volatile hydrocarbons; and finally, combined sodium and potassium.

High-Vacuum Still

The high-vacuum still, which has received considerable attention in this journal[33] is the subject of a recent interesting article.[34] Various types of molecular still both in the loose and in the precise sense are described; and the increased application of high-vacuum distillation in industry is urged. It is pointed out that although the method has been utilised largely for the commercial preparation of such products as vitamins, its possible applications are much wider. Suggested uses are (*a*) testing the purity and homogeneous nature of drugs; (*b*) separation and identification of groups of complex organic compounds such as the steroids; (*c*) advances in the chemistry of the carotenoid group of compounds; and (*d*) analysis of extracts from tissues and of various products of animal and human metabolism.

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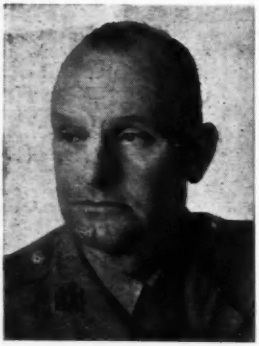
ERSATZ BINDING MATERIAL

To save coal tar for war industries, the Germans have been experimenting for some time to find a satisfactory material for binding coal and lignite briquettes, which are widely used for household and industrial heating in Germany. It is claimed that satisfactory results have been obtained by diluting coal tar with 50 per cent. artificial resins or sulphite waste liquors. Some success is also reported in pressing briquettes without the use of any binding substance at all. The Zellstoff-fabrik Waldhof, one of the largest German cellulose concerns, claims that it has obtained promising results from using sulphite lye as a binding substance for fuel and briquettes. Interest in such a process is heightened by the difficulties which cellulose plants are experiencing in disposing of their mounting quantities of waste products.

Chemical Industry in Kenya

Active Research Programme



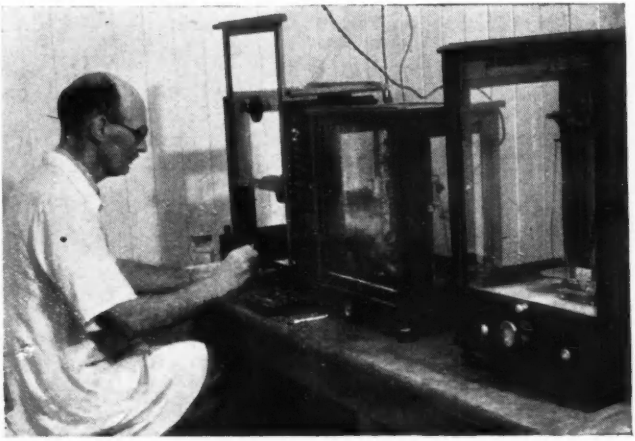
Lt.-Colonel A. J. Pelling, D.S.O., M.C., chairman of the East African Industrial Research and Development Board.

KENYA is on the way to becoming an industrialised colony. For a long time the secondary industries were discouraged because the tradition of agricultural colonies was to supply raw materials and tropical produce and leave the business of manufacturing to the workshops and factories at home. But new industries are growing steadily around the natural resources of the country. East African territories are rich in a great variety of raw materials; and the East African Industrial Research and Development Board is trying, in an effort to reduce demands on shipping space, to satisfy the colony's needs from her own raw materials. The Board's function is to encourage, promote and initiate the production of those commodities which will become scarce, if not unobtainable, in East Africa, and to see that the abundant raw materials are put to the best and most economical use.

Testing camouflage paint under outdoor conditions in Kenya.

Research for the Board is carried out in many laboratories in East Africa, including particularly those of the Agricultural Research Station at Amani, whose entire facilities are under its director, at the service of the Board. Under the Board's

A laboratory of the East African Industrial Research Board.

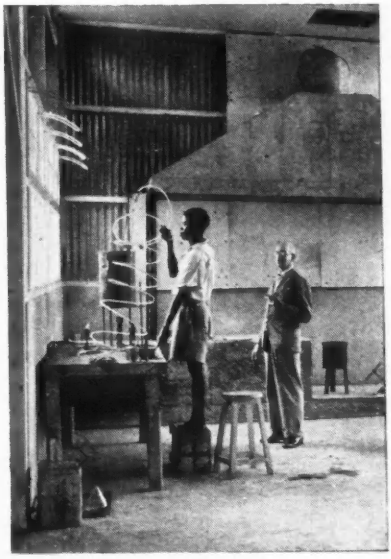


Dr. H. H. Storey, Research Liaison Officer, at work in a corner of the balance room at a Kenya laboratory.

direct control also is a permanent technical staff composed of chemists, engineers, draughtsmen, an economic adviser, and other executive officers. In the chemical laboratory at Nairobi, chemists examine intimately the properties of raw materials. In another part of the building are furnaces, boilers and elaborate machines—this is the engineers' kitchen, though it is not yet fully in operation.

The Board is now faced with an immense programme of development in industry. The Ordnance Paint Factory, which will come into production shortly, is the direct outcome of the efforts of the Board. This factory will be handed over to the military authorities when the production stage is reached. No plant has been specially imported, but it has been assembled from various sources all over the country or constructed in local workshops. Most of the raw materials are local: locally grown castor and linseed oils will be the vehicle for colours mined from the country's mineral resources (one of these pigments may seem familiar to East Africans, for they will have seen it in the hair of a Masai warrior). When it is considered that the imports into East Africa in 1940 of paints, varnishes, and colours were 23,000 cwt., and that, in order to meet military requirements, they might well have been doubled by now, the factory represents an important step forward. But it is hoped that the paint factory is merely the forerunner of many other thriving industries to come.

The manufacture of paper, important industrial chemicals, tiles and pottery, fertilisers, building materials, and petrol and its substitutes are at present among the Board's most urgent investigations. Others, such as malt for brewing, totaquina, shark liver oil, household polishes and brushes, are already in production or nearing the production stage, as a result, in part at least, of the research of the technical officers who collaborate with the Board, and of its sister committee in Dar-es-Salaam.



The engineers' "kitchen" in a Kenya laboratory. Construction is still in progress in this part of the building.

Vegetable Oils in Sugar Confectionery

Sweetening Agents : Solubilising Starch

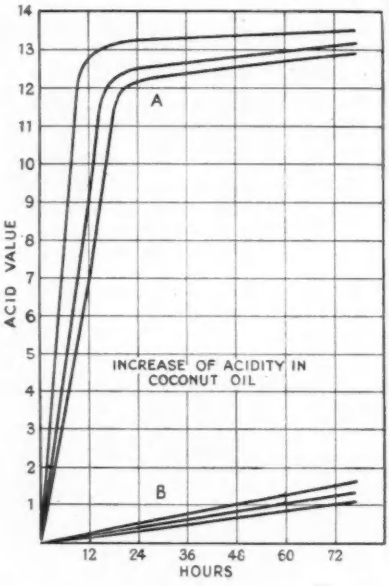
by A. E. WILLIAMS, F.C.S.

NOT the least difficulty at present encountered in sugar confectionery works is the acute shortage of sweetening agents, cane sugar and glucose, due to war conditions. But since an oil or fat of some description is a normal ingredient of sugar confectionery, such difficulties may be alleviated in many cases by the judicious use of an oil or fat of the lauric acid type, such as coconut or palm kernel oil. Both these oils have been used in the making of sugar confectionery for many years, and while their normal use in this direction represents no innovation, it is possible to employ them, by working in a specific manner, to enhance the now meagre sweetness of the confections, and thus reduce the proportion of glucose or cane sugar required.

In normal practice the object of adding an oil or fat to the sugar boiling pan is to prevent burning of the product in the pan and to give the necessary ductility to the finished confections. In addition to meeting these requirements an oil of the lauric acid type influences certain chemical reactions taking place in the boiling pan. For example, in a toffee recipe, in which fillers such as starch or dextrine are included, such fillers may be converted to dextrose (glucose) by the action of such oils as coconut or palm kernel oil. This conversion is due to the hydrolytic action of the oils, or of their fatty acids, on the starch or dextrine. So that the ingredients which are normally used as cheap filling agents, and which are, of course, entirely without any degree of sweetness, may be made to serve both as fillers and as sweetening agents.

Hydrolytic Properties

In order to improve the hydrolytic properties of an oil like coconut or palm kernel oil it is advantageous to create in the first place an emulsion of such oil with the skimmed milk to be used in the recipe. As the milk is for the most part water it is added in sufficient quantity to give the required water content in the finished confections, with an excess to cover the loss by evaporation during the boiling process. The emulsification of the oil and milk may conveniently be undertaken, in the absence of a separate emulsifying machine, in the boiling pan itself, particularly when the stirrer of the pan can be speeded up. During the emulsification process the temperature is raised to just under 100° C. Some milk casein is produced during the making of the emulsion, and the casein, apparently, accelerates the formation of free fatty acids from the oil. This acceleration is seen from the curves in the accompanying diagram, which show the increase in acid value of coconut oil emulsified with milk (A samples), and the oil stirred up with distilled water (B samples), the hours representing the period of standing at room temperature after emulsification. Acid value is here defined as the number of mgm. of KOH needed to neutralise the free fatty acids in one gram of the oil recovered from the emulsion or from the distilled water. Since skimmed milk was used in the emulsification, and the fatty acids obtained from this sparse milk fat would be negligible, it



may be assumed that the acidity contained in the A samples is derived for the most part from the coconut oil. Another advantage of first emulsifying the oil and milk before adding to the boiling pan is that the formation of anhydrous crystals of lactose, or milk sugar, is prevented during the boiling of the confections; which crystals being not so soluble as dextrine tend to deposit in masses and spoil the appearance of the finished product.

For confectionery, such as toffee, having essentially a sugar basis the cane sugar is first melted in the steam-jacketed pan, with

the stirrer in motion, then the emulsion of oil and milk is added. The contents of the pan are next stirred for from 15 to 20 minutes before adding a starchy filling material, *e.g.*, soluble starch or dextrine. In such a mixture the starchy filler is gradually modified and ultimately hydrolysed to glucose. Because of this reaction it is obviouse that it is possible to reduce appreciably, in recipes for boiled confections, the initial proportion of sweetening agent (glucose or cane sugar), since, as the boiling process is continued, the initially tasteless and insipid starchy fillers are themselves converted for the most part to a sweetening agent, glucose. This conversion of starch or dextrine to glucose in the pan is accelerated by the use of either coconut or palm kernel oil emulsified with milk.

Soluble Starch

Vegetable oils, including coconut and palm kernel oils, may also be of great service to the manufacturing confectioner in another direction, namely, in the preparation of soluble starch or dextrine which are needed as a filling material. The difference in price between these soluble products and ordinary starch is sufficient incentive for him to be interested in manufacturing his own, particularly as ordinary starch cannot be used direct in the boiling pan, owing to its insolubility in many types of confection. Starch can be rendered soluble and so made accessible for use in confectionery by merely roasting it at a temperature of about 200° C. This procedure, however, produces a burnt and bitter flavour in the product in addition to darkening it considerably, thus rendering it of little value in a high-class confection. But by immersing the starch in some of the coconut oil, or other oil, which is to be used in the confectionery recipe, the former may be rendered soluble at a lower temperature, only a faint discoloration occurs, and no adverse flavour is imparted because the starch is heated out of contact with air. The resulting mixture of soluble starch and dextrine is primarily of value as a filler in boiled sugar confections, and for admixture with fondant creams, etc. By this heat treatment of starch and oil little or no sugar is produced from the starch, although when a vegetable oil is used this solubilised product is in part hydrolysed to sugar during the subsequent boiling of the confectionery.

The starch to be rendered soluble is preferably rice starch, unpowdered and of the familiar "crystal" variety. A vessel constructed either of copper or of steel is convenient in which to heat the starch, an efficient stirring apparatus being essential. The source of heat may be either gas or electricity, or if steam at a sufficiently high pressure to give a temperature of 190° C. is available in the factory, a steam-jacketed vessel is quite suitable, *i.e.*, an ordinary sugar-boiling pan may be used if it is capable of withstanding the necessary steam pressure, about 180 lb./sq. in. An appropriate quantity of the oil or fat is first placed in the pan and heated to about 105° C.; the starch is next added slowly and with constant stirring, so that the moisture in the starch may be driven off without "bumping." The water content of crystal rice starch usually lies between 17 and 20 per cent., and this moisture may be almost completely removed in about 15 minutes with the oil at 105° C. and with a good stirrer. When all visible evolution of water has ceased the temperature is raised to about 185° C. and kept at this for 20 to 30 minutes. Rice starch varies in the length of time required to render it soluble in this manner; some grades may be soluble after 15 minutes' heating at 185° C., while others may require half an hour. This variation is probably due to the absence or otherwise of mineral constituents in the starch which act as catalysts in accelerating the progress of solubility.

A sample of the hot starch is withdrawn and its solubility tested by shaking it with warm water. This test should show it to be completely soluble in the water, with a thin layer of fat floating on the top of the water, before the batch is withdrawn from the pan. It is generally found that when the oil in the pan is relatively high in free fatty acidity, *i.e.*, 0.3 per cent. or more, the starch is solubilised in a shorter time than when the oil is practically neutral. When acquiring their edible oils, therefore, sugar confectioners need not insist, as they often do, on a practically neutral oil from the refiners, for a little acidity in the oil can be very helpful. To separate the soluble starch from the excess oil (which may, incidentally, be used again for the same purpose or in other usual recipes), the stirrer is stopped and the starch allowed to settle out. The bulk of the oil may then be run off, while the starch is drained in a suitable container having a base of fine mesh wire gauze.

Some Applications

After the starch is drained clear of adhering oil while still hot, the oil content which it has acquired through absorption is generally between 15 and 18 per cent., a proportion that approaches closely to the amount necessary in the preparation of boiled sugar goods. An average recipe for the latter, for example, may require from 5 to 10 per cent. of coconut oil and perhaps 50 per cent. of glucose. So that if, instead of using this 50 per cent. of glucose, about 55 per cent. of the solubilised product containing 16 per cent. of oil, and a few per cent. of brown cane sugar be used, a confection of equal quality results, while the cost is appreciably less. It does not necessarily follow that the acid method of solubilising starch, sometimes practised in confectionery works, is the more efficient because the resulting product usually contains some glucose; for the dextrinous product obtained from the oil-immersion process,

although initially it contains no sugar, is largely converted to sugar in the boiling pan during the making of the boiled confections. Thanks to its dextrine content, the solubilised product is of value in preventing the cane sugar in some types of confectionery from crystallising out. This action is based upon the adhesive nature of the dextrine, which retains the sugar in a colloidal suspension and so prevents it separating. Commercial liquid glucose is often too low in dextrine content to accomplish this. In the manufacture of fondant cream the dextrinised starch is of great value as a filler, for owing to its colloidal character it enables a higher percentage of water to be incorporated with the cream without affecting the normal physical properties of the latter. It is well known in fondant cream making that a relatively weak sugar solution, therefore one of high water content, induces the growth of unduly large crystals. The homogeneous colloidal nature which the dextrine imparts to the cream tends to promote the formation of a uniformly minute crystalline mass with no undesirable large crystals. Commercial glucose often has a tendency to invert the cane sugar ingredient to an appreciable extent, and it is frequently found that after completing a batch of boiled sweets, for example, over 10 per cent. of the original cane sugar has been inverted, with consequent loss of both firmness and sweetness. Generally speaking, the capacity for inversion is much less prominent in the solubilised product of starch produced by the oil-immersion method.

Barytes Producers

Association's First Annual Report

AT the recent annual meeting of the British Barytes Producers' Association the following officers were elected: Chairman: Mr. D. J. W. Orr (Orr's Zinc White, Ltd., and Wrentnall Baryta Co., Ltd.); vice-chairman: Colonel J. V. Ramsden (Devonshire Baryta Co., Ltd.); treasurer and hon. technical adviser: Mr. Alexander Reid; hon. auditor: Mr. I. D. Orr (Arran Barytes Co., Ltd., and William Wharton); secretary: Mr. R. Murdin Drake.

In the course of his speech the retiring chairman, Mr. L. P. O'Brien (B. Laporte, Ltd., and Malehurst Barytes Co., Ltd.), remarked on the useful function that the Association had performed since its establishment 15 months ago. The past year had been satisfactory: all the barytes that could be produced had been immediately sold, and members had risen to the occasion during the war by producing the extra quantity required through the expenditure of a great deal of money and of skilful effort. In his review of possible conditions after the war, Mr. O'Brien hoped that the industry would receive sympathetic consideration in official quarters and that they would not again be faced with the difficulty of competing with a huge importation of duty-free foreign barytes.

Production Sacrificed to "Sport"

Such barytes as is found in this country is mostly in remote and mountainous parts, so that a heavy expenditure of capital is necessary to develop it. All they asked was to be able to develop it without excessive risk of loss. During the past year his own company had been handicapped in the development of more than one deposit of barytes by the ground landlords' fear that the sporting amenities would be disturbed. The pooling of members' information had had excellent results; exchange of knowledge about working methods, and especially about silicosis experiences, could only be to the benefit of all. Relations of the Association with the Miscellaneous Chemicals Control had been excellent, the Control being particularly helpful in stopping the flow of essential labour to the armed forces. Still, with the labour problem as it now is, there was little prospect of opening up new barytes mines, a hazardous proposition at any time.

Landolphia

A South African Rubber Source

PROPOSALS to use the guayule and the *kok-saghyz* plants as substitutes for *Hevea* in the production of crude rubber have been repeated almost *ad nauseam*; but less has been heard of the *Landolphia* vine. This South African plant was experimented with in the days of the rubber "boom" in 1910, with some success, and proposals to revive these exploratory operations have awakened considerable interest. The landolphia grows wild along and near the east coast of South Africa from Natal to Mozambique and beyond, and the rubber that it produces is reported to be free from extraneous chemical substances, such as resin—an advantage over the eucalyptus and other rubber-containing plants of the sub-continent. A company is reported to be negotiating with the authorities for concessions in the landolphia-bearing areas. They are in possession of the details of the extraction process which was successfully developed by the original concessionnaires, and according to the *South African Mining and Engineering Journal*, have secured the services both of the engineer who was instrumental in erecting the special plant required, and of the field expert who was responsible for the cutting and collection of the vine in its natural habitat.

Cellulose Lacquers

Recent Chemical Developments

IN a paper read before the London Section of the Oil and Colour Chemists' Association on October 17, Mr. E. H. Davies discussed recent progress in the manufacture of lacquers which contain some cellulose derivative as the main film-forming ingredient.

The idea of emulsifying a cellulose lacquer, he said, was probably one of the most outstanding and surprising attempts which the lacquer chemist had made in his efforts to obtain high percentages of solid matter per unit volume of coating lacquer. The actual preparation of the emulsion was very largely a matter of circumstances, but one essential was efficient emulsification mechanically such as in a colloid mill or by high speed mixing followed by homogenisation. The behaviour of the emulsion after application was very much more complex and had undoubtedly been the cause of many failures, while the type and quantity of the resin or resins present in the initial lacquer also played an enormous part in controlling the behaviour of the emulsification process and in the drying of the applied film. Much work remained to be done, but in Mr. Davies's opinion lacquer emulsions should enjoy a successful future in certain fields, *e.g.*, paper coating.

Three Main Ether Groups

Since the end of the last war, three main groups of cellulose ether had been prepared: methyl, ethyl and benzyl. Of these ethyl cellulose was the most recent addition and had received the most attention. Its outstanding properties were: solubility in hydrocarbons such as benzol, or mixtures of hydrocarbons and alcohols; ready compatibility with nitrocellulose in all proportions; and greater flexibility than nitrocellulose, particularly at low temperatures; while at high temperatures the possible breakdown products were not acidic as were those of nitrocellulose under similar circumstances. A further property of considerable importance was its capability of being rendered plastic at about 135° C.

Mixed Esters

The mixed esters of cellulose comprised two main groups; cellulose acetobutyrate and cellulose acetopropionate. The latter possessed more general solubility and compatibility characteristics but each was roughly similar to cellulose acetate in properties, with greater resistance to water and alkali than the straight ester; some workers also believed that the acetopropionate was more light-fast and durable than any cellulose derivative so far produced. The tremendous strides which had been made in lacquer constitution indicated that the lacquer chemist deserved commendation for the work he had done.

In the course of answers to questions, Mr. Davies said that nitrocellulose did not stand up to very low temperatures and that was one of the reasons for the introduction of ethyl cellulose, which stood up to high and low temperatures. Nitrocellulose manufacturers had laid down plant at enormous expense for the purpose of removing traces of iron from the water they used for washing the cellulose pulp after the nitration process, the reason being that minute traces of iron caused instability in the nitrocellulose. The question of impurities would certainly have to be dealt with very circumspectly or they would be blowing themselves up before they knew where they were.

Insecticide Scheme

Committee to Approve New Types

THE discovery of the value, for insecticidal and fungicidal purposes, of chemicals more complicated than the well-known lime-sulphur and tar oil winter wash types has raised an active demand for some official action which would enable the new insecticides and fungicides to receive official approval under their brand names. Accordingly, with the concurrence of the Agricultural Improvement Council, a scheme has now been agreed by the Agricultural Departments of Great Britain and the Association of British Insecticide Manufacturers.

The following committee has been appointed to advise on applications from manufacturers for the approval of their products under this scheme: Professor J. W. Munro, M.A., D.Sc. (chairman); Messrs. C. E. Foister, B.A., Ph.D., C. T. Gimingham, O.B.E., B.Sc., F.I.C., A. J. Holden, B.Sc., F.I.C., Hubert Martin, D.Sc., F.I.C., W. C. Moore, M.A., D. D. Pratt, M.A., Ph.D., H. Shaw, M.A., Ph.D., and J. T. Martin, B.Sc., Ph.D. (secretary).

Assessory Panel

The principles and conditions of approval for the various groups of products will be drawn up by a joint panel composed of the members of the above committee, together with four representatives of the Association of British Insecticide Manufacturers, a representative of the Government Chemist, and a representative of the Agricultural Research Council. This joint panel will also consider any points of principle arising out of products submitted. As it will not be possible to deal with all categories of product immediately, manufacturers should await a further announcement before submitting applications for approval. Particulars may be obtained on application to the Secretary of the Committee, Plant Pathological Laboratory, Ministry of Agriculture, Milton Road, Harpenden, Herts.

Personal Notes

MR. A. ORR, of the Chemistry Department of the Royal Technical College, Glasgow, has become secretary of the Glasgow Scientific Film Society.

MAJOR ARTHUR QUILTON COOPER has been elected Prime Warden of the Worshipful Company of Dyers for the ensuing year, and MR. J. NORMAN DAYNES, K.C., is the new Renter Warden.

MR. J. R. FELTON, O.B.E., has been appointed to the Board for Mining Examinations as Chief Inspector of Mines *vice* Mr. F. H. Wynne, O.B.E., B.Sc., retired. MR. E. H. FRAZER, O.B.E., is also appointed as one of the two Divisional Inspectors of Mines *vice* Mr. T. Ashley, retired. Four other changes in the constitution of the Board are likewise announced by the Ministry of Fuel and Power.

Obituary

MR. ALEXANDER PULLAR, who died at Perth on October 12, was well-known in the Glasgow area, having been for many years with the Parkvale Chemical Co., Ltd., Paisley.

MR. HORACE BROADBENT, who died on October 20 at his home at Edgerton Grove, Huddersfield, aged 79, was chairman of Thomas Broadbent & Sons, Ltd., Huddersfield, and one of the leading authorities in the country on centrifugal machinery.

MR. JOHN GEORGE WHITE, who died at Tunbridge Wells on October 18, aged 92, was chairman and governing director of R. White & Sons, Ltd., and H. D. Rawlings, Ltd., mineral water manufacturers. He was also chairman of The London Essence Co., Ltd., Camberwell, makers of essences and essential oils.

PROFESSOR K. NEVILLE MOSS, O.B.E. who died in Birmingham on October 20, aged 51, had been Professor of Coal and Metal Mining at Birmingham University since 1922. Among other offices he had occupied were those of chairman of the Advisory Committee on Coal and Petroleum of the Mineral Resources Department of the Imperial Institute, and president of the South Staffordshire and Warwickshire Institute of Mining Engineers.

MR. R. W. HUNTER, M.I.C.E., who died on October 11, at the age of 60, had been chief engineer to The Gas Light and Coke Company for five years, retiring from that position at the end of 1940. He was appointed to The Gas Light and Coke Company's staff in 1902 and remained with the company until his retirement. In 1933 he was awarded the H. E. Jones Gold Medal for a paper on the coke oven plant at Beckton.

GAS-FUEL ECONOMY

A consultative committee has been formed by the Gas Directorate of the Gas and Electricity Division of the Ministry of Fuel and Power to see on behalf of the Minister that everything possible is being done to ensure that the minimum quantities of coal, oil, and coke are being used in order to secure the required output of gas. It is expected that the committee will work as far as possible through already existing regional organisations within the industry. The committee consists of Messrs. F. M. Birks, T. F. E. Rhead, H. S. Cheetham, and T. C. Finlayson. The first meeting of the committee is being held on October 27.

PHOSPHORUS FOR OILS

Oils which are more durable at high temperatures can be produced by adding a small amount of elementary phosphorus to ordinary mineral lubricating oil, according to a patent acquired by the Standard Oil Company. Only minute amounts of the phosphorus are needed to increase durability, and to prevent any corrosive action of the phosphorus on engine-metal, a small amount of tricresyl phosphate is added as a corrosion inhibitor. In a second patent tetramethyl diaminodiphenyl methane is used as the corrosion inhibitor.

INDIAN RUBBER PRODUCTION

With a view to increasing rubber production in India, a Rubber Production Board is to be appointed, representing the Governments of Travancore, Cochin, Madras, the Commerce and Supply Departments of the Central Government, and the rubber producers' organisations. As 76 per cent. of India's rubber is produced in Travancore, the Board's headquarters will be there, and Sir C. P. Ramaswami Iyer, Dewan of Travancore, will be the first chairman. A rubber purchase office will be established in Cochin, and the Government of India will be the sole purchaser of all types and grades of rubber.

The Board of Trade draws attention to the fact that, on and after November 1, no person shall sell or offer for sale by retail any article controlled under the Limitation of Supplies (Toilet Preparations) (No. 4) Order (including face powder and toilet dusting powder), unless at the time of the sale the container in which, or from which, that article is sold or offered is labelled with the name and address of the actual manufacturer or licensed packer. This rule applies even when the retailer had obtained the goods from his supplier at a date before November 1. No application for a packer's licence received after November 1 will be considered.

New Control Orders

Paint Manufacture

THE Control of Paint, Lacquer and Varnish (No. 3) Order, 1942 (S.R. & O. 1942, No. 2074), provides that after October 19, no person shall acquire raw materials for the manufacture of paint, varnish, lacquer, or distemper and sell the resultant product, unless he holds a licence issued by the Ministry of Supply.

"Nucleus" firms have been nominated and firms which will transfer production under this scheme will be given until December 31, 1942, to close down. Licences are being issued by the Miscellaneous Chemicals Control to all firms whose returns under the Board of Trade census showed that their activities bring them under the new Order.

These licences control the acquisition and use of raw materials and the sale by the licensee of the finished product. The provisions of the Order do not apply to persons who make less than 5 gallons or 1 cwt. of paint, etc., in a calendar month. The Control of Paint, Lacquer and Varnish (Nos. 1 and 2) Orders are revoked.

Export of Crucibles, Insecticides, etc.

Under the Export of Goods (Control) (No. 40) Order, 1942 (S.R. & O. 1942, No. 2101) which comes into force on November 2, 1942, licences will be required to export, to all destinations, crucibles; plumbago (graphite); briquetting plant; cellulose nitrate (nitrocellulose) and mixtures containing it; cinchonidine and cinchonine and salts and preparations thereof; nickel compounds and mixtures containing any of these compounds; sodium sulphide; and water-treatment compositions containing phosphates.

Applications to export briquetting plant should be filed through the Brickmaking, Clayworking and Briquetting Machinery Export Group (Messrs. Peat, Marwick and Mitchell), 94-98 Petty France, London, S.W.1.

Licences will also, in future, be required to export insecticides, fungicides, weedkillers, animal dips and disinfectants containing arsenic compounds, chlorinated naphthalenes, cyanides, fluorides, metaldehyde, nicotine or its salts, petroleum oils, pyrethrum or its extracts, resinates, rosin (colophony), liquid rosin (tall oil), silicofluorides, sulphides, or sulphur.

Citric Acid Prices

The Ministry of Food has made the Citric Acid (Control and Maximum Prices) Order, 1942 (S. R. & O. 1942, No. 2148), which came into force on October 19. The Order requires that persons who sell citric acid otherwise than by retail shall obtain a licence to sell such acid. It also prohibits the sale of citric acid otherwise than by retail at prices above those laid down in the schedule to the order. Maximum prices for anhydrous acid range from 1s. 6¼d. per lb. for lots of 5 cwt. or more to 2s. 3¼d. per lb. for less than 4 lb.; and, for acid other than anhydrous, from 1s. 5d. to 2s. 1d. per lb. The maximum prices include all costs of delivery by the seller at the buyers' premises and of packing and containers, and no additional charge may be made by the seller for delivery, packing or containers.

Unfenced Machinery

By the Operations at Unfenced Machinery (Amended Schedule) Regulations, 1942, dated October 6 (S. R. & O. 1942, No. 2116), the Minister has amended the schedule of processes in which, under the Factories Act, 1937 (Sec. 15), and the Operations at Unfenced Machinery Regulations, 1938, certain operations may be carried out with machinery unfenced. The following processes are included in the new schedule.

All processes in the manufacture of beet sugar, paper or paper-board, viscose transparent paper or film, sodium carbonate by the ammonia soda or Solvay process, caustic soda by the ammonia soda or Solvay process or by continuous causticising, sulphur dioxide, sodium hydrosulphite; all processes in the extraction of oil from cereals or seeds; also, the filtering process in the manufacture of sulphate of ammonia; the phosphate reaction pumping process in the manufacture of concentrated fertiliser; the electrolytic process for the manufacture of metallic sodium as regards the operation of dredging the sodium cells; the electrolytic process for the manufacture of caustic soda; any manufacturing process in which a mixture of nitric and sulphuric acids is employed and where risk of fire or explosion would arise if the transmission machinery were stopped; the reducing, volatilising and decomposing processes in the production of nickel; and any process in the manufacture of phosphorus halides directly from phosphorus involving risk of considerable rise in temperature and of evolution of toxic gases if the transmission machinery were stopped.

Edible Oil

The Ministry of Food states that the very small quantity of edible oil which has up to the present been available for household consumption will no longer be distributed.

Olive oil or groundnut (arachis) oil will be available for certain medicinal purposes against a doctor's prescription only. Special Vegetarian/Kosher cooking fat will be available up to the amount of the cooking-fat ration (2 oz.) to those persons authorised to receive it.

General News

Seaweed located on the West Coast of Ireland has been found suitable for agar-agar production and its various possibilities are being investigated.

Workers and residents in the City of London have now contributed £75,000 to the Red Cross Penny-a-Week Fund. The figure for the County of London is £475,000.

The Prime Minister hopes to be able to address a conference of representatives of the coal mining industry on October 31. Arrangements are being made for representatives from all the mining areas to attend.

All application forms (E.D. 279) for the ten extra clothing coupons to which certain chemical workers are entitled must be completed by the employer and sent to the local offices of the Ministry of Labour and National Service before October 31.

The Ministry of Food reminds manufacturers and pre-packers of foods subject to the Manufactured and Pre-Packed Foods Order, 1942, that returns of manufacturing and pre-packing operations must reach the Ministry by October 31.

The fourth number of *Endeavour*, which is as interesting and well produced as its predecessors, contains the welcome announcement that the English edition has been so appreciated in Moscow and Kuibyshev that arrangements are now being made to produce an edition in the Russian language.

When asked last week in the House of Commons whether he would substitute bronze coins for silver, Sir Kingsley Wood replied that as the metals used in bronze coins were urgently needed for war purposes, and as the minting of bronze coinage would involve labour difficulties, the suggestion was impracticable.

An interesting method of utilising the disadvantages of a product was illustrated by Mr. W. A. Dickie, F.I.C., in his recent talk on acetate rayon to the Bradford Textile Society. Acetate napery had been considerably developed on the Continent, and in this case the difficulty of dyeing the material proved an advantage, because it made the napery relatively difficult to stain.

A new Eastman Kodak patent for recovering silver from exposed negatives involves giving the film a bath in a solution of either potassium permanganate or dichromate and an inorganic acid. The solution is then treated with iron containing a small amount of carbon and silicon. Silver is dissolved from the film, then precipitated into the bath, while the permanganate or dichromate is reduced and the acid converted into a harmless salt.

From Week to Week

The Ministry of War Transport has sent a letter to all road transport undertakings owning 150 or more public service vehicles requesting them to convert 10 per cent. of their vehicles to producer gas. The plant to be used is the Government unit and the work must be completed by July next.

A list of firms in the paint and varnish industry which have received "nucleus certificates" under the Board of Trade concentration scheme has been supplied to the National Federation of Paint and Varnish Manufacturers and to its area committee. Transfer of production is to start immediately.

The use in the soil of magnesian lime, which is at present unpopular in some parts of the country owing to the belief that it has a toxic effect on the soil, is recommended by Mr. H. T. Jones in *The Fertiliser Journal* for October 14. Lower magnesian limestone containing 20-45 per cent. magnesium carbonate and 50-75 per cent. calcium carbonate is common in the North of England.

It is learned in Dublin that Irish-produced glycerine will shortly be placed on the market. Successful experiments, which have been carried out at the request of the Emergency Scientific Research Bureau, have yielded a product up to the B.P. standard. Needs of Irish firms engaged in the production of medicinal preparations will be the first to be met, it is understood.

The vitamin-C content of blackcurrant syrup and purée will be higher this year than last, the vitamin content of the fresh fruit last year having been abnormally low. The syrup will contain not less than 20 mgm. of vitamin C per fluid oz., and the purée not less than 24 mgm. per fluid oz. The total pack will contain as much vitamin C as 4000 to 5000 tons of fresh oranges. Increased supplies of orange juice are available from America.

The following have passed the September examination for the Fellowship of the Institute of Chemistry. In inorganic chemistry: C. J. Bloomfield, J. Ratcliffe, and, with special reference to the chemical analysis of non-ferrous metals, alloys and steels, W. Furness. In organic chemistry: P. J. Platt, A. Topham. In the chemistry (including microscopy) of food and drugs, and of water: G. W. P. Stretton. In industrial chemistry, with special reference to dyestuffs and intermediates: W. Holburn; with special reference to chocolate, cocoa, etc.: J. H. Mallows. In general analytical chemistry: R. H. Halliwell. In the examination for the associateship, 23 candidates were successful.

A number of unofficial publications concerning the problems of food decontamination have recently appeared on the market. The Ministry of Food wishes it understood that in no case are these booklets published with official approval and that, where procedures at variance with official methods are recommended, they should be treated with the greatest reserve. This warning, of course, does not apply to articles describing original research work and published by reputable scientific journals.

Shipments from the phosphatic rock deposits in County Clare, which are being worked by the Government-sponsored Minerals Exploration and Development Co., are now being sent to Irish fertiliser factories after the rock has been crushed locally. It is understood that manufactured superphosphate will be available for delivery to Irish farmers befor the end of next March. The engineer in charge of production is Mr. J. B. Esmonde, brother of the late Lieut.-Commander Eugene Esmonde, V.C., R.N.

An increase in membership of 35 per cent. during the year was reported at the recent annual meeting of the Irish Chemical Association in Dublin. The following council was elected for 1942-43: President, Mr. B. G. Fagan, F.I.C.; vice-president, Mr. D. Mellon; hon. treasurer, Dr. J. J. Keane; hon. secretary, Mr. A. Q. MacParland; committee, Mrs. S. T. O'Kelly; Miss H. Cassidy; Dr. J. J. Lennon; Mr. D. T. Flood; Mr. H. D. Thornton; and Mr. P. A. Spillane.

Foreign News

The Swedish Government has decided not to award any Nobel Prizes this year.

As the supply of ethylene glycol in recent months in Canada has not equalled the demand for war purposes, a new order has been issued prohibiting the sale of ethylene glycol anti-freeze for use in trucks, motor-cycles and passenger cars.

The U.S. Government has agreed to accept a rise in price of U.S. $3 per ton for Chilean nitrate, according to Press reports quoted by the Bank of London and South America. This will help to compensate for the increased cost of petrol and oil which has to be imported for use in the industry.

Annual production of kaolin by the Swedish Kaolin Syndicate founded last year at Fyledalen, Sweden, is placed at 6000 metric tons. Another company, operating in south-eastern Scania, produces 5000 tons of kaolin annually. The Fyledalen product has been found in tests to compare with kaolin imported from England, Sweden's chief source prior to the war. Annual Swedish consumption for paper and porcelain production has been 40,000 metric tons.

A new anti-dimming composition, patented in the U.S., comprises water and a wetting agent of the sulphate ester type, and is produced by sulphuric acid treatment of long-chain aliphatic alcohols.

Experiments in the use of lignin as an extender for rubber and synthetic rubber, are being conducted by the Marathon Chemical Co., Rothschild, Winconsin, U.S.A., and lignin is already being used commercially in small amounts.

Plastics are being substituted in the U.S.A. for critical materials in army fighting equipment. Satisfactory results have been obtained in utilising special phenolic moulding compounds for the Browning automatic rifle stock, but investigations by the Small Arms Division of the Ordnance Department show that plastics have not yet reached the stage where they can take the place of black walnut generally.

Forthcoming Events

There will be a meeting of the London Section of the **Electrodepositors' Technical Society,** at 4.30 p.m., on **October 26,** at the Northampton Polytechnic, Clerkenwell, E.C.1. Mr. E. H. Laister will present a paper on "War-Time Applications of Precious Metal Plating."

On **October 29,** at 2 p.m., in the Engineers' Club, Albert Square, Manchester, the **Oil and Colour Chemists' Association** (Manchester Section) will hold an open discussion on topical questions from members. Some of these will deal with chemically prepared iron oxides, driers, substitute paints, and resin-oil combinations.

A meeting of the London Section of the **Society of Chemical Industry** will be held jointly with the Plastics Group and the **Oil and Colour Chemists' Association,** at 2.30 p.m., on **November 2,** in the Chemical Society's rooms, Burlington House, W.1. A lecture on "Heat Resisting and Stoving Finishes" will be given by Mr. R. L. Frost.

The first meeting of the Agriculture Group of the **Society of Chemical Industry** will be held jointly with the Food Group in the Lecture Hall of the London School of Hygiene and Tropical Medicine, Keppel Street, W.C.1, at 2.30 p.m. on **November 3.** Dr. G. H. Bates will give a lecture on "The Increasing Food Output of Great Britain."

A joint meeting of the **Institution of Electrical Engineers** and the **Institution of Mechanical Engineers** will be held in the Lecture Theatre of the I.E.E., Victoria Embankment, W.C.2, on **November 5,** at 5.30 p.m., when Mr. J. N. Waite, of the Central Electricity Board, will read a paper entitled "Coal for Steam Raising."

Company News

Lightalloys, Ltd., propose a final dividend of 12½ per cent. (same).

Fison, Packard & Prentice, Ltd., Ipswich, have changed their name to Fisons, Ltd.

Babcock and Wilcox, Ltd., have declared an interim dividend of 4 per cent. (same) on the ordinary stock.

Sadler and Co., Ltd., have announced a dividend of 5 per cent. for the year to June 30 (same).

New Companies Registered

"Landlimes," Ltd. (376,571).—Private company. Capital: £3000 in 3000 shares of £1 each. Manufacturers of and dealers in fertilisers, quarry owners, dealers in lime, chalk, sand etc. Directors: W. Atkin; Ll. I. Pinkney. Registered office: 2 Chapel Street, Bridlington.

Graham Tatford & Co., Ltd. (376,544).—Private company. Capital: £2000 in 2000 shares of £1 each. To acquire the business of a manufacturing chemist carried on by Arthur G. Tatford, at 95 Hayling Avenue, Portsmouth. Directors: A. G. Tatford, 95 Hayling Avenue, Portsmouth; R. G. Tremlett; L. J. Evans; A. V. Glanville.

Capillarifuge, Ltd. (376,574).—Private company. Capital: £1000 in 1000 shares of £1 each. Engineers, filtration experts and research workers, to take out or acquire patents in connection with chemical dehydration, flocculation, etc. Directors: J. M. R. Brownlow, L. Parsons, A. W. Simmons. Solicitors: Markby, Stewart & Wadeson's, 5 Bishopsgate, E.C.2.

Antigen Laboratories, Ltd. (376,570).—Private company. Capital: £5000 in 5000 shares of £1 each. Chemical and biological manufacturers, bacteriologists, manufacturers of and dealers in medicinal, chemical, industrial and other preparations, etc. Subscribers: H. A. C. Crowe, J. K. Lywood. Solicitors: H. A. Crowe and Co., 34 Essex Street, W.C.2. Registered office: 95 Great Portland Street, W.1.

Fabon (Scotland), Ltd. (22,158).—Registered in Edinburgh as a company limited by guarantee, without share capital; to operate a scheme of concentration which has been approved by the Minister of Food for businesses engaged in technical fat-producing and bone-degreasing industries in Scotland. The management is vested in a committee, the first members of which are representative of the industries concerned.

Fine Grinding, Ltd. (376,189).—Private company. Capital: £1000 in 1000 shares of £1 each. To grind, crush, manipulate and prepare for market, manganese, rutile, chrome ore, ferro-silicon, brown oxide and other substances, manufacturers of and dealers in scouring powders, soap and washing materials, etc. Directors: Gwyneth Jepson and Edna H. Smith. Registered office: Eyam, near Sheffield.

Concrete Waterproofers, Ltd. (376,315).—Private company. Capital: £2000 in 10,000 founders' shares of 1s. each and 1500 ordinary shares of £1 each. Manufacturers of and dealers in waterproofing, hardening, and fire-resisting compounds, powders and materials, oil and colour men, flooring contractors, manufacturers of chemical preparations, etc. Directors: P. D. Yeo and Evelina M. Yeo. Registered office: 136 Fenchurch Street, E.C.3.

Bertram of Bond Street, Ltd. (376,098).—Private company. Capital: £4200 in 3600 preference shares of £1 each and 12,000 ordinary shares of 1s. each. To acquire the business of a soap distributor and brand owner carried on by Bertram May at 49 Old Bond Street, and to carry on the business of manufacturers and dealers in soap, washing materials, toilet requisites, etc. Directors: Bertram May, Hugh E. Axton. Registered office: 49 Old Bond Street, W.1.

Brine Supplies, Ltd. (376,416).—Private company. Capital: £6000 in 6000 shares of £1 each. To acquire land at or near Stafford or elsewhere, to sink a shaft or bore-hole and erect works, to carry on the business of brine owners and pumpers, white salt, alkali and chemical manufacturers, etc. Subscribers: Mangers Salt Works, Ltd.; Stafford Salt and Alkali Co., Ltd. Solicitors: Pickering and Pickering, Bank Passage, Stafford.

Stewart and Gray, Ltd. (376,409).—Private company. Registered September 30. Capital: £50,000 in 50,000 shares of £1 each. To acquire and amalgamate the businesses of porcelain enamel manufacturers, general enamellers, sanitary and enamelling engineers and expert enamelling advisers, formerly carried on by J. F. Stewart and Co., Ltd., and J. Gray and Sons, Ltd. Directors: W. Thomason, Windleshaw, Nelson Road, New Malden; J. W. G. Pedder; R. J. Thomason; N. F. Parker; J. T. Gray.

Chemical and Allied Stocks and Shares

ACTIVITY has been fairly well maintained in the industrial and kindred sections of the Stock Exchange, where further gains were shown on balance, while elsewhere firmness ruled in British Funds. Yield considerations continued to attract attention to Imperial Chemical ordinary, which were 35s. 9d. compared with 35s. 1½d. a week ago. I.C.I. 7 per cent. preference units were better at 34s. B. Laporte were around 70s. and firmly held, awaiting the interim dividend, which is generally expected to be maintained. Lever & Unilever were slightly better at 30s. 9d., while, in advance

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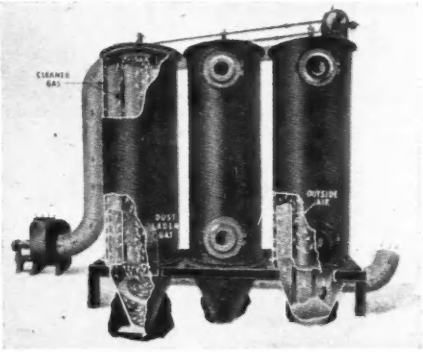

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of the interim dividend, United Molasses were little changed at 30s. 3d. Moreover, the units of the Distillers Co. were well maintained at 80s. 6d.; the yield on the basis of last year's 16¼ per cent. dividend is small, but this reflects the exceptionally strong balance-sheet. There has been a further rise from 72s. 6d. to 73s. 9d. in British Oxygen, and from 47s. 9d. to 48s. 3d. in British Aluminium. British Match were steady at 36s. 9d. Many other shares were also favoured on the view that during the period of the war they offer reasonable prospects of stable dividends, and in some cases scope for an upward trend in earnings and distributions after the war. Although the dividend is again limited to 4 per cent., Wall Paper Manufacturers deferred units were better at 29s. 3d. compared with 28s. 9d. a week ago, the recovery in profits for the past financial year having created a good impression; the directors are placing £100,000 of the profits to a special reserve for rehabilitation.

Elsewhere, Tube Investments have been firm at 88s. 9d.; the dividend announcement is due in a few weeks. Dunlop Rubber were 1s. better at 31s. 6d., while Borax Consolidated deferred were well maintained at 34s. and Imperial Smelting were slightly higher at 12s. 9d. Goodlass Wall changed hands up to 12s. 9d. and Cellon 5s. shares up to 17s. 6d. Erinoid were around 10s., while business around 2s. 10½d. was recorded in Catalin shares, and British Industrial Plastics were 4s. 6d. In other directions, Cooper McDougall have transferred at 25s. and Greeff-Chemicals 5s. ordinary at 5s. 9d. Morgan Crucible second preference changed hands at 22s. 9d. at one time. Moreover, British Plaster Board were active and well maintained at 26s. 3d. On the other hand, Barry & Staines eased further from 36s. 6d. to 36s. and Nairn & Greenwich were again 55s. Triplex Glass, which remained under the statement at the recent annual meeting that a return to high rates of dividend is unlikely after the war, moved down to 27s. Textile shares showed few important movements: British Celanese issues kept around the lower levels to which they went following publication of the scheme for dealing with arrears of second preference dividend; Bradford Dyers ordinary and preference were little changed, awaiting the financial results.

At 74s. 3d. Turner & Newall lost part of an earlier improvement, but the market is continuing to talk of the possibility of a better dividend, although it is realised that profits are again likely to be dealt with in a conservative manner. Richard Thomas ordinary shares have remained active around 8s.; elsewhere, United Steel continued steady at close on 25s. aided by satisfaction with the financial results. Stewarts & Lloyds were little changed at 49s. 9d., while Guest Keen were better at 28s. 1½d. Gas Light & Coke ordinary improved slightly to 14s. 9d. it being pointed out in the market that there should be no difficulty in restoring dividend payments after the war. At the present time demand for industrial securities is not, of course, based only on questions of the immediate dividend return. In fact, there is general willingness to take a long view on hopes that earnings may recover in the post-war years. Boots Drug have been steady at 38s. 3d. while Timothy Whites improved to 22s. 10½d. Oil shares held recent gains.

British Chemical Prices

Market Reports

MOST of the leading industrial chemicals are moving along steady lines, and makers' deliveries against contracts during the past week have been well maintained. In regard to new business for home account, supplies of a number of products are much below the current demand, while a firm tone is in evidence for those chemicals of which reasonable quantities are being freely offered. In the soda products section a steady inquiry is reported for Glauber salt and salt cake, while caustic soda and acetate of soda are in good demand. There is a keen inquiry for the limited supplies of bichromate of potash, yellow prussiate of potash, and permanganate of potash. Citric acid is now controlled by the Ministry of Food and the Order is expected to be available shortly. Supplies of both tartaric and citric acids are reported to be adequate for approved users. There is no change to be reported in the coal-tar products market this week.

MANCHESTER.—Chemical prices generally on the Manchester market during the past week have maintained their firm undertone and no sign of easiness is apparent in any direction. Textile bleaching and dyeing chemicals are in good demand, having regard to the extent of the operations in this important using trade, and most other industrial consumers are maintaining their requirements at about recent levels. Most of the soda, ammonia, and magnesia compounds, as well as the acid products, are being taken up in good quantities. Among the by-products, contracts for pretty well all the light and heavy classes are being drawn against steadily.

Price Changes

Citric Acid.—Controlled prices per lb., d/d buyers' premises. For 5 cwt. or over, anhydrous, 1s 6¾d., other, 1s. 5d.; 1 to 5 cwt., anhydrous, 1s. 9d., other, 1s. 7d. Higher prices for smaller quantities.

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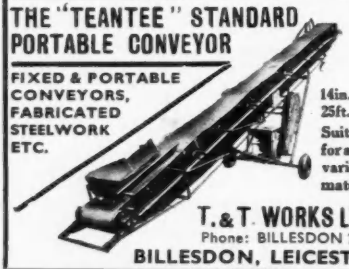
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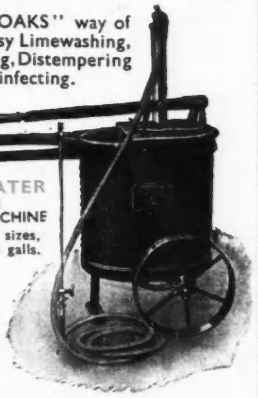

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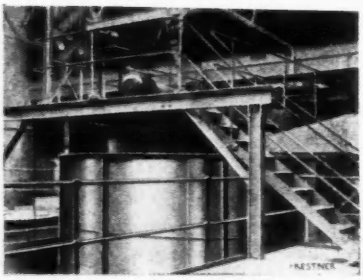

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